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CHROMOSOME NUMBER DETERMINATIONS IN FAM. COMPOSITAE, TRIBE ASTEREAE. VII. MOSTLY EASTERN NORTH AMERICAN AND SOME EURASIAN TAXA

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ABSTRACT. Chromosome numbers are reported for the first time for 303 individuals of 112 taxa and cultivars and five hybrids from 16 genera, nearly all from eastern Canada and the eastern United States. Counts for several taxa from China, Japan, the United Kingdom and for several garden cultivars of Old World taxa are reported. Also included are seven corrections and changes of identifications for previously published reports for taxa in *Solidago*. The majority of the reports are for asters listed in this paper under the generic name *Symphyotrichum* (including *Virgulus*) plus species of *Aster* (including *Asteromoea*, *Diplactis*, and *Kalimeris*), *Callistephus*, *Doellingeria*, *Eurybia*, *Galatella*, *Ionactis*, *Oclemena*, and *Sericocarpus*, and for goldenrods in *Solidago* and *Euthamia*. The following are first reports for the taxa: *Aster pyrenaeus* cv. "Lutetia", $2n = 36 + 2$–4 supernumeraries, cult. Ontario; *Solidago altiplanities*, $2n = 18$ from Texas; *S. arenicola*, $2n = 36$ from Alabama; *S. glomerata* $2n =$ ca. 126 (14*x*) from North Carolina; *S. speciosa* subsp. *pallida*, $2n = 18$ from South Dakota; *Symphyotrichum plumosum*, $2n = 8$ (two populations) from Florida; and *S. tradescanti*, $2n = 32$ from Maine. All other counts confirm previous reports for the taxa. A number of the reports are for rare taxa in Ontario: *Solidago arguta*, $2n = 18$, first count for Ontario; *Symphyotrichum praealtum* var. *praealtum*, $2n = 32$; *S. prenanthoides*, $2n = 32$, first counts for Ontario (8 populations); and *S. shortii*, $2n = 16$. A number of the counts are first reports for a particular taxon in a state (e.g., *Solidago altissima* subsp. *altissima*, $2n = 36$ from Tennessee; *S. brachyphylla*, $2n = 18$ from Florida; *S. canadensis* var. *hargeri*, $2n = 18$ from Virginia; *Symphyotrichum novae-angliae*, $2n = 10$ from Georgia and North Carolina; *S. priceae*, $2n = 64$ from Georgia). Differences in the karyotypes of Old and New World species of asters are discussed.

Key Words: Compositae, Astereae, chromosome numbers, *Aster*, *Chrysopsis*, *Eurybia*, *Pityopsis*, *Solidago*, *Symphyotrichum*

Determining the distribution patterns of cytotypes requires numerous counts from the range of a taxon. The determinations listed below are reported as contributions to such studies. This is the seventh in a continuing series of general reports on Astereae by the first author's

laboratory (Semple 1985; Semple and Chmielewski 1987; Semple et al. 1989, 1992, 1993, 2001).

MATERIALS AND METHODS

Meiotic counts were made from pollen mother cells (PMCs) dissected from buds fixed in the field in 3:1 EtOH : glacial acetic acid and subsequently stored under refrigeration in 70% EtOH. Mitotic counts were made from root tip cells taken from transplanted wild rootstocks or from seedlings grown from achenes collected in the wild. Root tips were pretreated in 0.01% colchicine or saturated paradichlorobenzene for 2–3 hr., fixed in either Modified Carnoy's Fixative (4:3:1 chloroform : EtOH : glacial acetic acid) or Acetic Alcohol Fixative (3:1 EtOH : glacial acetic acid) and hydrolyzed in 1N HCl for 25–30 min. at 60°C before squashing. Anther sacs containing PMCs and meristematic root tips were squashed in 1% acetic orcein, and counts of chromosomes were made from freshly prepared material. Permanent slides were made for new reports as described by Semple et al. (1981) and remain in the possession of J.C.S.

Vouchers for all counts are deposited in WAT. Identifications were made by J.C.S. In some cases, voucher specimens did not fit a published taxon description in one or more minor traits, such as amount of pubescence; these cases are indicated by the "aff." qualifier in the Appendix.

RESULTS AND DISCUSSION

Chromosome numbers are reported in the Appendix for 303 individuals of 112 taxa and cultivars and five hybrids from 16 genera nearly all from eastern Canada and the eastern United States. Included in the Appendix are reports for several taxa from China, Japan, the United Kingdom, and a half dozen garden cultivars of Old World taxa. Also included in the Appendix are seven corrections or changes of identification in *Solidago*. Wild populations were sampled in four provinces in Canada and 16 states in the United States. In total, 264 new reports are for asters and goldenrods: *Aster*, *Doellingeria*, *Eurybia*, *Galatella*, *Ionactis*, *Oclemena*, *Sericocarpus*, *Symphyotrichum* (including *Virgulus*), and *Solidago* and *Euthamia*, respectively. The following are first reports for the taxa: *Solidago altiplanities*, $2n = 9_{II}$ from Texas; *S. arenicola*, $2n = 36$ from Alabama; *S. glomerata*, $2n =$ ca. 126 from North Carolina; *S. speciosa* subsp. *pallida*, $2n = 18$ from South Dakota; *Symphyotrichum plumosum*, $2n = 8$ (two populations) from Florida; and *S. tradescanti*, $2n = 32$ from Maine. All other counts

confirm previous reports for the taxa and most are presented without comment. A number of the reports are for rare taxa in Ontario: *Solidago arguta*, $2n = 18$, first count for Ontario; *Symphyotrichum praealtum* var. *praealtum*, $2n = 32$; *S. prenanthoides*, $2n = 32$, first counts for Ontario (8 populations); and *S. shortii*, $2n = 16$. A number of the counts are first reports for a particular taxon in a state: *Solidago altissima* subsp. *altissima*, $2n = 36$ from Tennessee; *S. brachyphylla*, $2n = 18$ from Florida; *S. canadensis* var. *hargeri*, $2n = 18$ from Virginia; *Symphyotrichum novae-angliae*, $2n = 10$ from Georgia and North Carolina; and *S. priceae*, $2n = 64$ from Georgia.

The Appendix includes data corrections or changes of identification for seven previously reported counts of *Solidago*. Six note changes in identification as a result of work done in preparing the treatment of *Solidago* for the Flora North America project (Semple and Cook, in press). The seventh corrects errors in reporting the ploidy level and location data. The first report of $2n = 18$ for *S. altiplanities* was previously reported as a count for *S. speciosa* var. *angustata* (Semple and Chmielewski 1987). The report of $2n = 36$ for *S. altissima* subsp. *altissima* from a glade in Davidson Co., Tennessee was previously reported as a count for *S. canadensis* aff. var. *canadensis* (Semple et al. 1992). The first report of $2n = 18$ for *S. speciosa* subsp. *pallida* from South Dakota was previously reported as a count for *S. speciosa* var. *angustifolia* (Semple et al. 1984). Two tetraploid counts for *S. leavenworthii* from Florida were previously reported under the name *S. petiolaris* (Semple et al. 1984). The tetraploid report for *S. mollis* var. *mollis* from Oklahoma was previously published as *S. mollis* var. *angustifolia*, $2n = 9II$ (Semple and Chmielewski 1987). And lastly, the tetraploid report for *S. shortii* from Nicholas Co., Kentucky was previously published in error as $2n = 18$ from Flemming Co.: S of town of Bluelicks, S banks of Bluelicks R. (Semple et al. 1993); this confirms the previous reports for the species by Beaudry (1963).

ADDITIONAL COMMENTS ON GENERIC LIMITS OF ASTERS

In the previous paper in this series (Semple et al. 2001), a significant shift in how asters were treated was adopted over earlier papers in the series; western North American asters were placed in *Eurybia*, *Eucephalus*, *Ionactis*, *Oreostemma*, *Sericocarpus*, and *Symphyotrichum*. In this paper, eastern North American asters are treated in *Doellingeria*, *Eurybia*, *Ionactis*, *Oclemena*, *Sericocarpus*, and *Symphyotrichum*. The difference between treatments in the two papers is due strictly to the

distributions of the genera in North America. *Eucephalus* and *Oreostemma* are western North American genera, while *Doellingeria* and *Oclemena* are eastern North American. Molecular data conclusively show that *Aster* in the new restricted sense is Eurasian, with only one arctic-alpine species, *A. culminis* A. Nels., occurring in North America (Brouillet et al. 2001a, 2001b; Semple et al. 2002, unpubl. data). The genera of asters native to North America are basal or near basal members of several clades within the North American Clade of the tribe Astereae (Brouillet et al. 2001a, 2001b; Noyes and Rieseberg 1999; Semple et al. 2002, unpubl. data). Although Xiang (1994) and Xiang and Semple (1996) presented data on chloroplast DNA restriction site variation that demonstrated conclusively that the genus *Aster sensu* Jones (1980) and *sensu* Semple and Brouillet (1980) was polyphyletic, their sample did not include sufficient numbers of non-aster taxa to reveal the monophyly of the North American clade. Nesom (1994) presented a revised overview of the asters and made a large number of combinations in a number of the segregate genera that he recognized on morphological grounds. Other combinations were proposed in previous papers or subsequently (Nesom 1992, 1993a, 1993b; Semple et al. 2002; Wunderlin and Hansen 2001). Semple et al. (1996) proposed an alternative nomenclature in which many of the species Nesom placed in the genera *Canadanthus*, *Eurybia*, and *Symphyotrichum* (including *Virgulus*) were retained in *Aster*, while accepting the need to recognize *Diplactis*, *Doellingeria*, *Eucephalus*, *Ionactis*, *Oreostemma*, and *Oclemena* as separate genera. This latter scheme was rejected (Semple et al. 2002) in favor of the nomenclature adopted in here, which is very much in agreement with Nesom (1994). To facilitate the transition from the nomenclature accepted in previous papers in this series to what we believe will ultimately become the generally accepted nomenclature, the older names are given in brackets in the Appendix.

Comparison of karyotypes of Eurasian and North American asters. Included in this paper are reports for 14 taxa/cultivars and one hybrid of Eurasian asters and aster-like genera (Appendix): *Aster ageratoides* (two subspecies and one cultivar), *A. alpinus*, *A. amellus* (two cultivars, one sold as *A. pyrenaeus* cv. "Lutetia"), *A.* ×*frikartii* (*A. amellus* × *A. thomsonii*), *A. mongolicus A. scaber*, *A. tataricus*, *A. tongolensis*, *Callistephus chinensis*, *Galatella punctata*, and *Heteropappus hispidus*. The size of the chromosomes of all these $x = 9$ taxa were much larger than the chromosomes of any of the $x = 9$, 8, or 7 taxa of aster genera in the North American clade: *Ampelaster*, *Canadanthus*,

Eurybia, *Doellingeria*, *Ionactis*, *Oclemena*, *Sericocarpus*, and *Symphyotrichum*. Even the large chromosomes of the $x = 4$ *Symphyotrichum concolor* and *S. plumosum* were not as large as most of the chromosomes in the karyotypes of the Eurasian taxa examined. Huziwara (1959) first noted this size difference between Asiatic asters and North American asters. Based on observations made for this paper and Semple et al. (2001), it appears that in general Eurasian asters have larger chromosomes than most, if not all North American Astereae, with the possible exception of the very derived low base number taxa such as *Machaeranthera gracilis* (Nutt.) Shinners. Huziwara (1959) noted that the Japanese species of *Erigeron* he examined had small chromosomes like North American species of the genus, which is North American in origin (Noyes 2000; Noyes and Rieseberg 1999). Further study is needed on many more taxa to determine how general the trend is for non-North American Astereae to have larger chromosomes than members of the North American clade. Based on published ideograms (Grau 1973), the size range in chromosomes among species of the African genus *Felicia* is similar to that observed in this paper for Eurasian and North America species of asters. The count for *Felicia amelloides* reported here in the Appendix is a meiotic count and thus the karyotype was not analyzed. Likewise, many reported counts for Astereae are meiotic and much additional work is needed to obtain mitotic karyotype data. Furthermore, differences in techniques used in preparing mitotic counts make published information potentially inconsistent, particularly in terms of the size and degree of coiling of the chromosomes. Any comprehensive survey of Astereae chromosome size will need to take these inconsistencies into consideration.

Nesom (1994) noted that in *Aster sensu lato* the classification of NOR chromosomes ("satellite"; nucleolar organizer region bearing chromosomes) presented by Semple et al. (1983) needed review because the "euaster" type was based on species no longer included in *Aster*. Nesom (1994) referred to the "euaster" type of Semple et al. (1983) as the "eurybia" type, which has the NOR near the centromere resulting in a large distal portion (satellite) and a small proximal portion on the short arm of the NOR chromosome. This type is found in *Eurybia* and *Symphyotrichum*, and, therefore, potentially it is derived at least twice in the North American asters. Since the chromosome classification was based on a pre-molecular understanding of the asters and since it was based on North American taxa, a full review of NOR chromosomes is needed for the entire tribe. Clearly, the "primitive" NOR type of Semple et al. (1983) is at best only applicable to the North American clade,

which is the most derived group in the tribe (Brouillet et al. 2001a, 2001b; Noyes and Rieseberg 1999; Semple et al. 2002). The NOR chromosome of *Aster* in the new strict sense is illustrated well in Chatterji (1962) for that of *A. amellus* and in Tara (1972) for several eastern Asian asters. The NOR of the triploid cultivar of *Galatella punctata* (*Aster sedifolius*) observed in our study had a smaller distal satellite and a more median centromere than the *Aster* karyotypes, but the chromosomes in both were large. The NOR chromosomes of *Felicia* illustrated in Grau (1973) are similar to, though in some cases significantly larger than, the "virguloid" type of North American *Symphyotrichum* subg. *Virgulus*. Nesom (1994) referred to the Old World NOR type as the "Asterinae" type, based primarily on published karyotypes in Huziwara (1962 and cited papers) and Chatterji (1962), but without additional cytological observations. Further work is needed to see if this NOR type is shared by many non-aster Old World and South American taxa in a wide range of genera. As with karyotype size, trends in NOR chromosome morphology need to be reassessed to determine if there are any generalities to be made.

Included in this paper are counts for two species of *Doellingeria sensu* Nesom (1993b): *D. infirma* and *D. scabra* (treated here as *Aster scaber*). Nesom (1993b) placed the latter in the eastern Asian taxon *Doellingeria* sect. *Cordifolium* (Kitamura) Nesom. Our living collections of *A. scaber*, however, had involucral traits more similar to those of species of *Eucephalus* of western North America than *Doellingeria* of eastern North America (*sensu* Semple and Chmielewski, in press; synonym: *Aster* sect. *Triplopappus*, Semple et al. 1991; includes the type of genus *D. umbellata*). The chromosomes of the three species of *Doellingeria* (permanent slides in the first author's collection) were smaller than the Asiatic aster species examined, including *A. scaber*. Huziwara (1962) reported that he did not observe a big difference between his one sample of *D. umbellata* (cultivated plant from the Jardin Botanique, Montréal, Québec) and other Asiatic asters, which did not include Asiatic species of *Doellingeria sensu* Nesom. Molecular studies (Brouillet et al. 2001a, 2001b, unpubl. data) indicate the Asiatic species belong either in *Aster* in the revised sense or possibly in a new segregate genus, if the Eurasian genus *Aster* is divided up further following more detailed phylogenetic studies of the Eurasian taxa.

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LITERATURE CITED

BEAUDRY, J. R. 1963. Studies on *Solidago* L. VI. Additional chromosome numbers of taxa of the genus. Canad. J. Genet. Cytol. 5: 150–174.

BROUILLET, L., G. ALLEN, J. C. SEMPLE, AND M. ITO. 2001a. ITS phylogeny of North American asters (Asteraceae: Astereae): Basal grade to North American lineages and distinct from Eurasian ones. CBA/ABC Annual Meetings, Okanagan Univ. College, Kelowna, BC, Canada. Abstract website (http://www.sci.ouc.bc.ca/biol/CBA/abstract.html).

———, ———, ———, AND ———. 2001b. ITS phylogeny of North American asters (Asteraceae: Astereae). Botany 2001 "Plants and People" Conference, Albuquerque, NM. Abstract website (http://www.botany2001.org/section12/abstracts/63.shtml).

CHATTERJI, A. K. 1962. Structure and behavior of chromosomes in different varieties of *Aster amellus* L. and the mode of origin. Caryologia 15: 515–524.

GRAU, J. 1973. Revision der Gattung *Felicia* (Asteraceae). Mitt. Bot. Staatssamml. München 9: 195–705.

HUZIWARA, Y. 1959. Chromosome evolution in the subtribe Asterinae. Evolution 13: 188–193.

———. 1962. Karyotype analysis in some genera of Compositae. VIII. Further studies on the chromosomes of *Aster*. Amer. J. Bot. 49: 116–119.

JONES, A. G. 1980. Data on chromosome numbers in *Aster* (Asteraceae), with comments on the status and relationships of certain North American species. Brittonia 32: 240–261.

NESOM, G. L. 1992. Transfer of *Chaetopappa elegans* to *Ionactis* (Asteraceae: Astereae). Phytologia 73: 416–424.

———. 1993a. The genus *Oreostemma* (Asteraceae: Astereae). Phytologia 74: 305–316.

———. 1993b. Taxonomy of *Doellingeria* (Asteraceae: Astereae). Phytologia 75: 452–462.

———. 1994. Review of the taxonomy of *Aster sensu lato* (Asteraceae: Astereae), emphasizing the New World species. Phytologia 77: 141–297.

NOYES, R. D. 2000. Biogeographical and evolutionary insights on *Erigeron* and allies (Asteraceae) from ITS sequence data. Pl. Syst. Evol. 220: 93–114.

——— AND L. H. RIESEBERG. 1999. ITS sequence variation supports single origin for North American Astereae (Asteraceae), deep geographic divisions in *Aster s.l.* Amer. J. Bot. 86: 396–412.

SEMPLE, J. C. 1985. Chromosome number determinations in fam. Compositae, tribe Astereae. Rhodora 87: 517–527.

———, R. A. BRAMMALL, AND J. G. CHMIELEWSKI. 1981. Chromosome numbers of goldenrods, *Euthamia* and *Solidago* (Compositae–Astereae). Canad. J. Bot. 59: 1167–1173.

——— AND L. BROUILLET. 1980. A synopsis of North American asters: The subgenera, sections and subsections of *Aster* and *Lasallea*. Amer. J. Bot. 67: 1010–1026. [*Lasallea* = *Virgulus*]

——— AND J. G. CHMIELEWSKI. 1987. Chromosome number determinations in fam. Compositae, tribe Astereae. II. Additional counts. Rhodora 89: 319–325.

——— AND ———. In press. *Doellingeria* Nees. *In*: Flora of North America Editorial Committee, eds., Flora of North America North of Mexico, Vol. 20. Asteraceae. Oxford Univ. Press, Oxford and New York.

———, ———, AND C. C. CHINNAPPA. 1983. Chromosome number determinations in *Aster* L. (Compositae) with comments on cytogeography, phylogeny and chromosome morphology. Amer. J. Bot. 70: 1432–1443.

———, ———, AND M. A. LANE. 1989. Chromosome number determinations in fam. Compositae, tribe Astereae. III. Additional counts and comments on generic limits and ancestral base numbers. Rhodora 91: 296–314.

———, ———, AND C. LEEDER. 1991. A multivariate morphometric study and revision of *Aster* subg. *Doellingeria* sect. *Triplopappus* (Compositae: Astereae). Canad. J. Bot. 69: 256–276.

———, ———, AND CHUNSHENG XIANG. 1992. Chromosome number determinations in fam. Compositae, tribe Astereae. IV. Additional reports and comments on the cytogeography and status of some species of *Aster* and *Solidago*. Rhodora 94: 48–62.

——— AND R. E. COOK. In press. *Solidago*. *In*: Flora of North America Editorial Committee, eds., Flora of North America North of Mexico, Vol. 20. Asteraceae. Oxford Univ. Press, Oxford and New York.

———, S. HEARD, AND L. BROUILLET. 2002. Cultivated and native asters of Ontario (Compositae: Astereae): *Aster* L. [including *Asteromoea* Blume, *Diplactis* Raf. and *Kalimeris* (Cass.) Cass.], *Callistephus* Cass., *Galatella* Cass., *Doellingeria* Nees, *Oclemena* E.L. Greene, *Eurybia* (Cass.) S.F. Gray, *Canadanthus* Nesom, and *Symphyotrichum* Nees (including *Virgulus* Raf.). Univ. Waterloo Biol. Ser. 41: 1–134.

———, ———, AND CHUNSHENG XIANG. 1996. The Asters of Ontario (Compositae: Astereae): *Diplactis* Raf., *Oclemena* Greene, *Doellingeria* Nees and *Aster* L. (including *Canadanthus* Nesom, *Symphyotrichum* Nees and *Virgulus* Raf.). Univ. Waterloo Biol. Ser. 38: 1–94.

———, G. S. RINGIUS, C. LEEDER, AND G. MORTON. 1984. Chromosome numbers of goldenrods, *Euthamia* and *Solidago* (Compositae: Astereae). II. Additional counts with comments on cytogeography. Brittonia 36: 280–292. [Addendum Brittonia 37: 121. 1985]

———, CHUNSHENG XIANG, JIE ZHANG, M. HORSBURGH, AND R. C. COOK. 2001. Chromosome number determinations in fam. Compositae, tribe Astereae. VI. Mostly western North American taxa and comments on generic treatments of North American asters. Rhodora 103: 202–218.

———, JIE ZHANG, AND CHUNSHENG XIANG. 1993. Chromosome number determinations in fam. Compositae, tribe Astereae. V. Eastern North American taxa. Rhodora 95: 234–253.

TARA, M. 1972. Cytogenetic studies on natural intergeneric hybridization in *Aster* alliances I. *Aster ageratoides* subsp. *ovatus* ($2n = 36$) × *Kalimeris incisa* ($2n = 72$). Bot. Mag. (Tokyo) 85: 219–240.

WUNDERLIN, R. P. AND B. F. HANSEN. 2001. Seven new combinations in the Florida flora. Novon 11: 366–369.

XIANG, CHUNSHENG. 1994. Molecular systematic study of *Aster* sensu lato and related genera based on chloroplast DNA restriction site analysis. Ph.D. dissertation, Univ. of Waterloo, Waterloo, ON, Canada.

——— AND J. C. SEMPLE. 1996. Molecular systematic study of *Aster* sensu lato and related genera (Asteraceae: Astereae) based on chloroplast DNA restriction site analyses and mainly North American taxa, pp. 393–423. *In*: D. J. N. Hind and H. Beentje, volume eds. [D. J. N. Hind, Editor-in-Chief], Compositae: Systematics. Proc. Int. Compositae Conference, Kew, 1994. Vol. 1. Systematics. Royal Botanic Gardens, Kew, U.K.

APPENDIX

CHROMOSOME NUMBER DETERMINATIONS OF ASTEREAE

Chromosome number determinations of Astereae from Canada and the United States are arranged alphabetically by species. Collectors' names are abbreviated as follows: *C* = R. Cook; *C & C* = R. Cook & D. Cook; *Ch* = J. G. Chmielewski; *F* = S. Faulkenham; *S* = J. Semple; *Zh* = J. Zhang. All vouchers are deposited in WAT.

Aster ageratoides Turcz. subsp. *leiophyllus* (Franch. & Sav.) Kitam. – $2n = 36$. JAPAN. Okayama Pref.: Niimi City, Niimi, *Tara s.n.* (count from seedling).

A. ageratoides Turcz. subsp. *ovatus* (Franch. & Sav.) Kitam. – $2n = 36$. JAPAN. Okayama Pref.: Okayama City, Mt. Hauda, *Tara s.n.* (count from seedling).

A. ageratoides Turcz. variegate-leaved cultivar – $2n = 36$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., garden cultivar, *S 11013*. [sold under the name *Kalimeris incisa* (Fisch.) DC. cv. "variegata" but the cypsellae have a well-developed pappus not found in the *Kalimeris* group of asters].

Aster alpinus L. cv. "Goliath" – $2n = 18$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., cultivated in garden (source: Epic Perennials Ltd.), *S 11003*.

A. amellus L. cv. "Violet Queen" – $2n = 54$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., cultivated in garden, *S 11008* (source: Heritage Perennials Ltd.).

A. ×*frikartii* ex hort. Frikart Nursery in Switzerland (*A. amellus* L. × *A. thomsonii* C.B. Clarke) – $2n = 54$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., cultivated in garden, *S 11012* (source: Heritage Perennials Ltd.).

A. mongolicus Franch. [*Asteromoea mongolica* (Franch.) Kitam.] – $2n = 18$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., cultivated in garden, *S 11002*.

A. pyrenaeus Desf. *ex* DC. cv. "Lutetia" – $2n = 36 + 2$–4 supernumeraries.

CANADA. Ontario: Waterloo R. M., Waterloo, 207 Candlewood Cres., cultivated in garden, *S 11104*. [Semple et al. (2002) noted that this cultivar may be derived from *A. amellus* rather than *A. pyrenaeus*.]

A. scaber Thunb. – $2n = 18$. CHINA. Beijing, outskirts of city, *Li Nan s.n.* (count from seedling). JAPAN. Okayama Pref.: Niimi City, Niimi, *Tara s.n.* (count from seedling).

A. tataricus L. f. – $2n = 54$. U.S.A. North Carolina: Guilford Co., Hwy. 220 3 km N of Greensboro, escaped from cult., *Ch & Hart 393*. Virginia: Grayson Co., VA-16 0.4 km N of Troutdale (Co. Rd.-602), *S 10749*.

A. tongolensis Franch. – $2n = 54$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., cultivated in garden, *S 11004*.

Boltonia diffusa Elliott – $2n = 18$. U.S.A. Florida: Franklin Co., S of Sumatra, Apalachicola N.F., junction of For. Rd.-129 and For. Rd.-129A, *S 10926*.

Callistephus chinensis (L.) Nees – $2n = 18$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., garden cultivar, *S 11011*.

Chrysopsis floridana Small – $2n = 5_{II}$. U.S.A. Florida: Hillsborough Co., Apollo Beach, I-75 S entrance ramp right-of-way off FL-672, *S, Wunderlin & Walker 10889*; Riverview, Stirling Downs ELLAPPA, near Boyette Rd. and McMullen Rd., *S, Wunderlin & Walker 10885*.

C. godfreyi Semple f. *godfreyi*. – $2n = 5_{II}$. U.S.A. Florida: Escambia Co., Pensacola Beach, E end of town, FL-399, lot between elementary school and church, *S 10944*; Gulf Co., SE of Port St. Joe, US-98 2.8 km SE of Co. Rd.-C30A, *S 10922*.

C. gossypina (Michx.) Nutt. subsp. *cruiseana* (Dress) Semple – $2n = 9_{II}$. U.S.A. Florida: Okaloosa Co., Destin, dune remnant between Co. Rd.-2378 (old US-98) and US-98, SE of Best Western Motel and N of Scampi's, *S 10942*. – $2n = 18$. Florida: Walton Co., Dune Allen, Co. Rd.-30A W of Grayton Beach, *S 10565*.

C. gossypina (Michx.) Nutt. subsp. *gossypina* f. *gossypina* – $2n = 9_{II}$. U.S.A. Florida: Leon Co., SE of Tallahassee, US-319 ca. 4.5 km S of US-27, *S 10553*; Levy Co., NW of Chiefland, US-98 1.6 km SW of Co. Rd.-218, SW of Fanning Springs, *S 10913*.

C. lanuginosa Small – $2n = 5_{II}$. U.S.A. Florida: Bay Co., Panama City Beach, US-98 3.2 km W of US-98alt. (E), *S 10936*.

C. lanuginosa × *C. linearifolia* subsp. *linearifolia* – $2n = 5_{II}$, some irregularities. U.S.A. Florida: Bay Co., Panama City Beach, US-98 0.9 km E of FL-79, highly disturbed vacant lot by Escanaba Ave., *S 10939*. [Meiosis was regular in most PMCs; some cells have one multivalent; anaphase I and II appears normal with no bridges or lagging fragments; no micro pollen grains were observed in near-mature anthers.]

C. linearifolia Semple subsp. *linearifolia* – $2n = 5_{II}$. U.S.A. Florida: Bay Co., Panama City Beach, US-98 0.9 km E of FL-79, highly disturbed vacant lot by Escanaba Ave., *S 10937*.

C. mariana (L.) Elliott – $2n = 8_{II}$. U.S.A. Florida: Marion Co., NW of Ocala, US-27 0.6 km SE of Blichton (Co. Rd.-326), *S 10910*. – $2n = 24$. Georgia: Dade Co., SE of Trenton, Lookout Mt., GA-136 0.4 km E of Sunset Rd., W of Cloudland Canyon St. Pk., *S 10990* (seedling). – $2n = 32$. Florida: Marion Co., W of Citra, Co. Rd.-318 1.6 km W of US-301, *S 10963*.

C. scabrella Torr. & A. Gray – $2n = 5_{II}$. U.S.A. Florida: Hillsborough Co., Tampa, University of South Florida, USF Biological Reserve, *S, Wunderlin & Walker 10890*; Marion Co., N of Lake Bryant, FL-40 at SE 165 Ave., E of Waldena, *S*

10909. – $2n = 10$. Florida: Lake Co., FL-19 9.5 km N of Altoona (FL-42), *S 10906* (seedling); Marion Co., S of Citra, US-231 3.1 km SW of Co. Rd.-318, *S 10964* (seedling).

C. aff. *scabrella* Torr. & A. Gray – $2n = 5_{II}$. U.S.A. Florida: Charlotte Co., NE of Cleveland, S of Shell Creek, Co. Rd.-764 E of FL-17, *S, Wunderlin, Walker, Delaney & Cochrane 10901* (plants have a more open lax capitulescence than typical *C. scabrella*).

Doellingeria infirma (Michx.) E.L. Greene – $2n = 18 + 2$ supernumeraries. U.S.A. West Virginia: Pocahontas Co., NW of Mill Point, Monongahela Nat'l. For., near junction of For. Rd.-102 and For. Rd.-107, *S 10716*.

Erigeron vernus (L.) Torr. & A. Gray – $2n = 18$. U.S.A. Georgia: Clinch Co., E of Fargo, GA-177 3.4 km NE of US-441, *S 10884*.

Eurybia avita (Alexander) G.L. Nesom [*Aster avitus* Alexander] – $2n = 36$. U.S.A. Georgia: Rabun Co., N of Tallulah Falls, US-441 2 km N of county line, *S 10861*.

E. chlorolepis (E.S. Burgess *in* Small) G.L. Nesom [*Aster chlorolepis* E.S. Burgess *in* Small] – $2n = 36$. U.S.A. Virginia: Grayson Co., Jefferson Nat'l. For., along Cabin Creek near hairpin turn on US-58, W of For. Rd.-797, *S 10757*.

E. compacta G.L. Nesom [*Aster gracilis* Nutt.] – $2n = 18$. U.S.A. New Jersey: Burlington Co., NE of Chatsworth, junct. of Co. Rd.-532 and NJ-72, *S 10370*; Ocean Co., W of Barnegat, Co. Rd.-554 1.7 km E of NJ-72, *S 10371*.

E. divaricata (L.) G.L. Nesom [*Aster divaricatus* L.] – $2n = 18$. U.S.A. Kentucky: Pike Co., SE of Canada, old US-119 3.1 km NW of KY-199 and Huddy, *S 10779*. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 1.6 km SW of NC-2, *S 10833*; Watauga Co., E of village of Beech Creek, US-321 0.7 km E of McGuire Rd., *S 10792*. Pennsylvania: Greene Co., PA-18 4 km SW of Holbrook, junction of Tom's Run Rd., *S 10674*; Lawrence Co., McConneth Mill St. Pk., *C & C 50*. Virginia: Bath Co., W of Mountain Grove, VA-39 3.1 km E of WV-92, *S 10723*. West Virginia: Greenbrier Co., Monongahela Nat'l. For., WV-39/55 by N Fork Cherry Creek, North Bend Picnic Area, *S 10710*; Marion Co., US-250 3.2 km S of Mannington, MP-19, *S 10690*; Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10696*.

E. surculosa (Michx.) G.L. Nesom [*Aster surculosus* Michx.] – $2n = 36$. U.S.A. North Carolina: Cherokee Co., US-64 7.8 km W of Ranger, *S & J.W. Semple 10351*.

Euthamia caroliniana (L.) E.L. Greene – $2n = 18$. U.S.A. Georgia: Echols Co., W of Statenville, GA-376, flood plain of Little R., *S 10877*.

E. graminifolia (L.) Nutt. – $2n = 18$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, University of Waterloo, along Laurel between Biology 2 and Minota Hagey Residence, *C & S 7*. U.S.A. Pennsylvania: Forest Co., Hwy-62 N of E Hickory, *C & C 63*.

Felicia amelloides (L.) Voss cv. "variegated" – $2n = 9_{II}$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., garden cultivar, *S 11009*.

Galatella punctata (Waldst. & Kit.) Nees [*Aster sedifolius* L. subsp. *sedifolius* cv. *nanus*; *A. canus* Waldst. & Kit. subsp. *punctatus* (Waldst. & Kit.) Soö] – $2n = 27$ (triploid). CANADA. Ontario: Waterloo Reg. Mun., Waterloo, 207 Candlewood Cres., garden cultivar, *S 11014*.

Heteropappus hispidus (Thunb.) Less. – $2n = 36$. CHINA. Beijing, *Li Nan s.n.* (count from seedling).

Ionactis linariifolia (L.) E.L. Greene [*Aster linariifolius* L.] – $2n = 9_{II}$. U.S.A.

Georgia: Taylor Co., E of Butler, GA-96 4.7 km E of GA-137, *S 10969*. – $2n = 18$. Virginia: Allegheny Co., US-220 6.7 N of Covington, S of scenic view area, *S 10731*.

Oclemena acuminata (Michx.) E.L. Greene – $2n = 18$. CANADA. Ontario: Haliburton Co., along road to W side of Paudash Lake, near boat launch, *S 10666*. U.S.A. North Carolina: Mitchell Co., Roan Mt., Garden Trail, W of parking lot near information booth, *S 10808*. Virginia: Grayson Co., Grayson Highlands St. Pk., Wilson Creek Trail along Wilson Creek, *S 10754*; Wythe Co., SW of Speedwell, Iron Mt., N side of Comers Rock, For. Rd.-57 5.5 km W of US-21, *S 10782*.

Pityopsis aspera (Shuttlew. *ex* Small) Small var. *adenolepis* (Fernald) Semple & F.D. Bowers – $2n = 18_{II}$. U.S.A. Florida: Okaloosa Co., E of Destin, Crystal Beach Drive, *S 10562*; also $2n = 36$ (from rootstock).

P. graminifolia (Michx.) Nutt. var. *aequilifolia* F.D. Bowers & Semple – $2n = 9_{II}$. U.S.A. Florida: Marion Co., FL-40 9.6 km W of Juniper Springs, Ocala Nat'l. For., 1.0 km E of For. Rd.-579, *S 10908*; Polk Co., N of Withla, Co. Rd.-33 1.0 km S of Lake Co. line, *S 10905*.

P. graminifolia (Michx.) Nutt. var. *latifolia* (Fernald) Semple & F.D. Bowers – $2n = 18_{II}$. U.S.A. Florida: Polk Co., SW of Withla, Deen Still Rd. 2.1 km W of Co. Rd.-33, *S 10904*. – $2n = 36$. Virginia: Southhampton Co., US-258 2.3 mi. N of Nottaway R., *S & Ch 5999*.

P. graminifolia (Michx.) Nutt. var. *tenuifolia* (Torr.) Semple & F.D. Bowers – $2n = 18$. U.S.A. Louisiana: Winn Parish, US-84 7.6 mi. W of Winnfield, junction of US-167, *S & Ch 6422*.

P. pinifolia (Elliott) Nutt. $2n = 18$. U.S.A. North Carolina: Harnett Co., NC-27 just NE of Pineview, *S 10537*.

Sericocarpus asteroides (L.) Nees [*Aster paternus* Cronquist] – $2n = 18$. U.S.A. Georgia: Dade Co., SE of Trenton, upper el. Lookout Mt., GA-136 0.4 km E of Sunset Rd., W of Cloudland Canyon St. Pk., *S 10991*.

S. tortifolius (Michx.) Nees [*Aster tortifolius* Michx.] – $2n = 18$. U.S.A. Florida: Franklin Co., S of Sumatra, Ft. Gadsden Historical Site, junction of For. Rd.-129 and For. Rd.-129C, *S 10923*; Hamilton Co., W of Jasper, junction of US-41 and FL-6, *S 10966*.

Solidago altiplanities C.E.S. Taylor & R.J. Taylor – $2n = 9_{II}$. U.S.A. Texas: Cottle Co., US-82 N of Paducah, 2.7 km S of North Pease R., *S 8234* [previously published as *S. speciosa* Nutt. var. *rigidiuscula* (Semple and Chmielewski 1987) and corrected here].

S. altissima L. subsp. *altissima* – $2n = 36$. U.S.A. Tennessee: Davidson Co., junction of TN-171 and US-41, *S & Ch 9124* [previously published as *S. canadensis* aff. var. *canadensis* (Semple et al. 1992) and corrected here]. – $2n = 54$. CANADA. Ontario: Essex Co., Maidstone Twp., Hwy.-22 W of Puce, Wallace Woods, *C & Parks 21*; Grey Co., Co. Rd.-12 W of Markdale, E of ON-6, *C & F 19*. U.S.A. Florida: Jackson Co., Co. Rd.-276 3.6 km N of US-231 in Alford, *S 10949*. Georgia: Dade Co., Trenton, along branch of Lookout Creek, near high school and GA-138, *S 11002*; Greene Co., N of Greensboro, Oconee N.F. boundary, GA-15, *S 10870*; Putnam Co., SW of Warfield, US-129 SW of Little R., 6.3 km W of GA-212, *S 10872*. Pennsylvania: Butler Co., Moraine St. Pk., *C & C 46*. West Virginia: Marion Co., S of Ida May, WV-216 3.8 km S of US-250, *S 10693*.

S. arenicola B.R. Keener & Kral – $2n = 36$. U.S.A. Alabama: Blount Co., NW of Cleveland, woods near Locust Creek of Warrior R., 200–300 m W of bridge on US-231, *S & B. Semple 11191*.

S. arguta Aiton var. *arguta* – $2n = 18$. CANADA. Ontario: Wellington Co., E of Guelph, Rockwoods Cons. Area, *S & Horsburgh 10574*. U.S.A. Virginia: Bath Co., W of Mountain Grove, VA-39 3.1 km E of WV-92, *S 10727*.

S. arguta Aiton subsp. *caroliniana* (A. Gray) G. Morton – $2n = 18$. U.S.A. Florida: Washington Co., S of Chipley, Falling Waters St. Rec. Area, *S 10950*. Georgia: Dade Co., SE of Trenton, NW side of Lookout Mt., GA-138 at upper hairpin turn, *S 10995*; Harris Co., E of Pine Mountain, Kings Gap Rd. 3.0 km E of GA-354, *S 10978*; S of Pine Mountain, Gallaway Gardens, *S 10981*. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 0.1 km S of NC-2, *S 10826*; Macon Co., S of Highlands, NC-28 8.3 km S of US-64, 0.8 km N of Wilson Rd., *S 10857*. Virginia: Grayson Co., VA-16 just S of county line, Hurricane Mt., *S 10743*; Washington Co., E of Damascus, US-58 7.1 km E of VA-91, Jefferson Nat'l. For., *S 10763*. – $2n = 36$. U.S.A. North Carolina: Transylvania Co., NC-281 near E side of Whitewater R., *S 10845*.

S. bicolor L. – $2n = 18$. CANADA. Ontario: Leeds Co., W of Rockport, woods just E of bridge to U.S.A., *S 10656*. U.S.A. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 0.1 km S of NC-2, *S 10827*. Pennsylvania: Greene Co., PA-18 4 km SW of Holbrook, junction of Tom's Run Rd., *S 10676*. Virginia: Allegheny Co., US-220 6.7 km N of Covington, S of Scenic View area, *S 10732*; Grayson Co., VA-16 just S of county line, Hurricane Mt., *S 10744*. West Virginia: Marion Co., US-250 2 km S of Metz, *S 10681*.

S. brachyphylla Chapm. – $2n = 18$. U.S.A. Florida: Gadsden Co., I-10 eastbound rest area, just E of Apalachicola R., *S 10957*.

S. caesia L. var. *caesia* – $2n = 18 + 1$ supernumerary. CANADA. Ontario: Elgin Co., S of Wallacetown, S of Tyrconnell, slope above small ceek near Lake Erie, *S & Zh 10583*.

S. canadensis L. var. *canadensis* – $2n = 18$. CANADA. Ontario: Bruce Co., S of Chelsey, Co. Rd.-19 1 km S of Side Rd. 30N, *C & F 14*; Hwy.-9 1.5 km SE of Carrick Twp. Rd. 30, S of Mildmay, *C & F 11*; Frontenac Co., W of Silver Lake, Hwy.-7 1.1 km E of Fall River Rd., *S 10658*; Peel Co., SE of Belfountain, by Bruce Trail, top of Niagara Escarpmant, N of Calledon Mt. Dr., *S & C 10653*. UNITED KINGDOM. SW of London, Surrey, Rochampton, Rochampton Rd., entrance way garden of Rochampton Club, *S 10390*.

S. canadensis L. var. *hargeri* Fernald – $2n = 18$. U.S.A. Virginia: Bath Co., VA-39 S of Mountain Grove, *S 10728*.

S. canadensis L. (naturalized European race) – $2n = 18$. UNITED KINGDOM. SW of London, Surrey, Barnes Rock Lane, NE of Upper Richmond Rd., S of BR-Barnes Station, *S 10389*.

S. erecta Pursh – $2n = 18$. U.S.A. Georgia: Dade Co., SE of Trenton, Lookout Mt., upper elevation, GA-136 0.4 km E of Sunset Rd., W of Cloudland Canyon St. Pk., *S 10996*; Greene Co., Oconee Nat'l. For., For. Rd. just E of GA-15 2.6 km S of Oconee R., *S 10868*; Taylor Co., SE of Carsonville, old US-19 N of GA-208, 0.6 km S of Little Patsiliga Creek, *S 10974*. Tennessee: Sullivan Co., US-421 5.8 km W of county line, *S 10771*. Virginia: Bath Co., W of Mountain Grove, VA-39 3.1 km E of WV-92, *S 10721*.

S. fistulosa Mill. – $2n = 18$. U.S.A. Florida: Washington Co., S of Chipley, Co. Rd.-77A 0.5 km S of Co. Rd.-C280, *S 10952*. Georgia: Echols Co., GA-94 2.8–3.0 km E of Statenville, *S 10879*.

S. gigantea Aiton – $2n = 18$. U.S.A. North Carolina: Transylvania Co., just NE of Conestee, US-276 8 km S of US-64 (in Brevard), *S 10842*. – $2n = 36$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, University of Waterloo, along Laurel Creek between Biology 2 and Minota Hagey Residence, *C & S 4*, *C & S 8*. U.S.A. North Carolina: Watauga Co., E of village of Beech Creek, US-321 0.7 km E of McGuire Rd., *S 10798*.

S. glomerata Michx. – $2n =$ ca. 126. U.S.A. North Carolina: Avery Co., Grandfather Mt., near bridge view parking lot, *S 10789*.

S. hispida Muhl. var. *hispida* – $2n = 18$. CANADA. Ontario: Bruce Co., S of South Sauble Beach, Co. Rd.-13 0.9 km S of French Bay Rd., *S 10671*; Lambton Co., Pinery Prov. Pk., Bittersweet Trail by Ausable R., *C & C 74*.

S. hispida Muhl. var. *huronensis* Semple – $2n = 18$. CANADA. Ontario: Bruce Co., Sauble Beach, dunes, *S 10672*; Lambton Co., Pinery Prov. Pk., Bittersweet Trail by Ausable R., *C & C 73*.

S. juncea Aiton – $2n = 18$. CANADA. New Brunswick: Charlotte Co., Grand Manan Is., Southwest Head area, *Hinds s.n.* Ontario: Lambton Co., Pinery Prov. Pk., Bittersweet Trail by Ausable R., *C & C 72*. U.S.A. Pennsylvania: Greene Co., PA-18 4 km SW of Holbrook, junction of Tom's Run Rd., *S 10677*. West Virginia: Marion Co., US-250 2 km SE of Metz, *S 10685*.

S. leavenworthii Torr. & A. Gray – $2n = 36$. U.S.A. Florida: Indian River Co., E of Fellsmere, *Semple et al. 7524* [previously published as *S. petiolaris* (Semple et al. 1984) and corrected here]; Taylor Co., N of Econfina, US-98 0.9 km E of Econfina R., *S 10918;* W of Hampton Springs, *Semple et al. 7443* [previously published as *S. petiolaris* (Semple et al. 1984) and corrected here].

S. mollis Bartl. var. *mollis* – $2n = 18_{II}$. U.S.A. Oklahoma: Greer Co., OK-9 E of Reed, *S & Heard 8235* [previously published as *S. mollis* var. *angustifolia* $2n = 9_{II}$ (Semple & Chmielewski 1987) and corrected here].

S. nemoralis Aiton subsp. *nemoralis* – $2n = 18$. CANADA. Ontario: Bruce Co., Co. Rd.-22 1.5 km W of Co. Rd.-10, *C & F 12*; Grey Co., junction of Hwy.-26 and Co. Rd.-112, *C & F 18*; Lambton Co., Pinery Prov. Pk., Carolinian Trail parking area, *C & C 75*; Wellington Co., E of Eramosa, Co. Rd.-124 (formerly Hwy.-24) 2.2 km W of Eramosa 5th line, *S & C 10649*. U.S.A. Ohio: Morrow Co., Mt. Gilead St. Pk., *C & C 28*; Tuscarawas Co., E of New Philadelphia, near junction of Hwy.-39 and Hendersoon School Rd., *C & C 45*. Virginia: Bland Co., S of Bastian, Appalachian Trail, just E of I-77, *S 10737*. West Virginia: Marion Co., US-250 2 km SE of Metz, *S 10682*; Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10704*. – $2n = 36$. CANADA. Ontario: Frontenac Co., Hwy.-7 W of Silver Lake, 1.1 km E of Fall River Rd., *S 10657*. U.S.A. Ohio: Holmes Co., E of Nashville, Hwy.-60/39 near Hwy.-754, *C & C 41*.

S. odora Aiton subsp. *chapmanii* (A. Gray) Semple – $2n = 18$. U.S.A. Florida: Hillsborough Co., Apollo Beach, I-75 S entrance ramp right-of-way off FL-672, *S, Wunderlin & Walker 10888*.

S. odora Aiton subsp. *odora* – $2n = 18$. U.S.A. Georgia: Echols Co., GA-94 2.8–3.0

km E of Statenville, *S 10878*. Florida: Jackson Co., FL-2 5.6 km E of US-231 in Campbellton, *S 10954*.

S. ohioensis Riddell – $2n = 18$. CANADA. Ontario: Bruce Co., S of South Sauble Beach, Pashwood Dr. just E of Co. Rd.-13, *S 10668*.

S. patula Muhl. subsp. *patula* – $2n = 18$. CANADA. Ontario: Elgin Co., S of Orwell, N of Springwater Cons. Area, *S & Zh 10589*; Haldimand-Norfolk Reg. Mun., Backus Woods, Conc. IV Rd., *S & Horsburgh 10575*.

S. petiolaris Aiton – $2n = 18$. U.S.A. Florida: Washington Co., S of Chipley, Falling Waters St. Rec. Area, *S 10948*.

S. puberula Nutt. subsp. *puberula* – $2n = 18$. U.S.A. North Carolina: Mitchell Co., NC-261 2.1 km below Carver Pass, *S 10815*. Tennessee: Carter Co., TN-143, Carver's Gap, just W of state line, *S 10807*.

S. rigida L. subsp. *rigida* – $2n = 36$. CANADA. Ontario: Walpole Is., NE corner, side road W of Chief Rd., *S & Zh 10603*.

S. rugosa Mill. var. *aspera* (Aiton) Fernald – $2n = 36$. U.S.A. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 2.8 km SW by road of NC-2, *S 10834*; Transylvania Co., just NE of Conestee, US-276 8.0 km S of US-64, *S 10843*.

S. rugosa Mill. var. *rugosa* – $2n = 18$. CANADA. Ontario: Bruce Co., between Mildmay and Harriston, Hwy.-9 1.5 km SE of Carrick Twp Rd.-30, *C & F 9*, *C & F 10*; Grey Co., Co. Rd.-25 W of Dornoch, *C & F 16*, side rd., *C & F 15*; Frontenac Co., Co. Rd.-509 NW of Robertsville Rd., *S 10664*; Wellington Co., 6th Line Rd. 0.2 km S of Co. Rd.-124, *S & C 10650*. U.S.A. Pennsylvania: Butler Co., Moraine St. Pk., Hwy.-528 ca. 2 km N of entrance, *C & C 55*. Virginia: Bland Co., S of Bastian, Appalachian Trail just E of I-77, *S 10735*. West Virginia: Marion Co., US-250 3.2 km S of Mannington, MP-19, *S 10687*. – $2n = 36$. U.S.A. Ohio: Ashland Co., Mohican St. Pk., *C & C 36*. West Virginia: Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10703*.

S. sempervirens L. subsp. *mexicana* (L.) Semple – $2n = 18$. U.S.A. Florida: Franklin Co., E of Apalachicola, along John Gorrie Mem. Bridge causeway, *S 10931*.

S. shortii Torr. & A. Gray – $2n = 36$. U.S.A. Kentucky: Nicholas Co., S of town of Blue Lick Springs, S banks of Licking R., *S & Suripto 9598* [previously published in error as $2n = 18$, Flemming Co.: S of town of Bluelicks, S banks of Bluelicks R. (Semple et al. 1993) and corrected here].

S. speciosa Nutt. subsp. *pallida* (Porter) Semple – $2n = 18$. U.S.A. South Dakota: Custer Co., S of Keystone, *S & Brouillet 4476* [previously published as *S. speciosa* var. *angustifolia* Torr. & A. Gray (Semple et al. 1984) and corrected here].

S. spithamaea M.A. Curtis *ex* A. Gray – $2n = 54$. U.S.A. North Carolina: Avery Co., top of Grandfather Mt., near parking lot, *S 10790*.

S. squarrosa Muhl. – $2n = 18$. CANADA. Ontario: Frontenac Co., Co. Rd.-509 NW of Robertsville Rd., *S 10663*; Haliburton Co., W of Carnarvon, Hwy.-118 2.8 km E of Anson Creek, *S 10667*.

S. stricta Aiton subsp. *stricta* – $2n = 18$. U.S.A. Florida: Dixie Co., W of Newport, US-98 0.9 km W of Co. Rd.-59, *S 10919*. – $2n = 54$. U.S.A. Florida: Dixie Co., US-98 NW of Co. Rd.-358, 6.3 km S of Tennille (FL-51), *S 10915*; Taylor Co., N of Econfina, US-98 0.9 km E of Econfina R., *S 10917*. Georgia: Echols Co., GA-94 2.8–3.0 km E of Statenville, *S 10880*.

S. tortifolia Elliott – $2n = 18$. U.S.A. Florida: Marion Co.: NW of Ocala, US-27 0.6 km SE of Blichton (Co. Rd.-326), *S 10911*.

S. uliginosa Nutt. – $2n = 18$. CANADA. Ontario: Frontenac Co., Co. Rd.-509 3.0 km N of Mississippi R., N of Snow Rd. Station, *S 10664*.

S. virgaurea L. subsp. *virgaurea* – $2n = 18$. SWEDEN. Värmland: Säldebråten (municipality of Kil), *P. Olsen s.n.*

Symphyotrichum ×amethystinum (Nutt.) G.L. Nesom [*Aster ×amethystinus* Nutt.] – $2n = 10$. CANADA. Ontario: Lambton Co., N of Camlachie, Lakeshore Rd. 7.2 km NE of Co. Rd.-26, *S & Zh 10596*.

S. chapmanii (Torr. & A. Gray) Semple & Brouillet [*Aster chapmanii* Torr. & A. Gray; *Eurybia chapmanii* (Torr. & A. Gray) G.L. Nesom] – $2n = 14$. U.S.A. Florida: Franklin Co., S of Sumatra, Apalachicola Nat'l. For., For. Rd.-1290 ca. 0.5 km S of For. Rd.-129, *S 10924*; Walton Co., E of Bruce, *S & Ch 6342*.

S. concolor (L.) G.L. Nesom [*Aster concolor* L.] – $2n = 8$. U.S.A. Florida: Columbia Co., NW of Highland Springs, US-27 0.8 km NE of Santa Fe R. and Co. line, *S 10960*; Gulf Co., SE of Port St. Joe, US-98 2.8 km SE of Co. Rd.-C30A, *S 10933*; Jackson Co., FL-271 S of Co. Rd.-164, 3.4 km N of Oak Grove Rd., *S 10955*. Georgia: Dade Co., SE of Trenton, upper elevation Lookout Mt., GA-136 0.4 km E of Sunset Rd., W of Cloudland Canyon St. Pk., *S 10992*; Taylor Co., E of Butler, GA-96 4.7 km E of GA-137, *S 10970*; Walker Co., Chattahoochee Nat'l. For., Maddox Gap, GA-136 at For.Rd.-250, *S 10983*.

S. cordifolium (L.) G.L. Nesom [*Aster cordifolius* L.] – $2n = 16$. U.S.A. Kentucky: Pike Co., SE of Canada, old US-119 3.1 km NW of KY-199 and Huddy, *S 10775*. North Carolina: Watauga Co., E of village of Beech Creek, US-321 0.7 km E of McGuire Rd., *S 10793*. Virginia: Bland Co., S of Bastian, Appalachian Trail just E of I-77, *S 10740*; Washington Co., S of village of Konnarock, US-58 6.1 km NW by rd. of county line, *S 10761*. West Virginia: Pocahontas Co., Watoga St. Pk., Co. Rd.-21, *S 10717*. – $2n = 32$. CANADA. Ontario: Frontenac Co., Co. Rd.-509 S of Clarendon Station, N of Burke Settlement Rd., *S 10659*. U.S.A. Georgia: Walker Co., W of LaFayette, E of Estella, GA-193 NW side of Pigeon Mt. at hairpin turn, *S 10987*. North Carolina: Macon Co., Highlands, NC-28 0.6 km S of US-64, opposite U.S. Post Office, *S 10855*. Ohio: Morrow Co., Mt. Gilead St. Pk., *C & C 29*. Pennsylvania: Greene Co., PA-18 0.8 km S of Nettle Hill, *S 10678*; Venango Co., PA-208 mp50, *C & C 57*. South Carolina: Greenville Co., US-276 5.2 km S (by rd.) of entrance to Caesar's Head St. Pk., *S 10840*. Virginia: Bath Co., W of Mountain Grove, VA-39 3.1 km E of WV-92, *S 10725*. West Virginia: Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10699*.

S. dumosum (L.) G.L. Nesom [*Aster dumosus* L.] – $2n = 16$. U.S.A. Florida: Washington Co., S of Chipley, Co. Rd.-77A 0.5 km S of Co. Rd.-C280, *S 10951*. – $2n = 32$. U.S.A. Georgia: Dade Co., SE of Trenton, upper el. Lookout Mt., GA-136 0.4 km E of Sunset Rd., W of Cloudland Canyon St. Pk., *S 10994*; Harris Co., E of Pine Mountain, N side of Pine Mt., GA-354 W of F.D.R. St. Pk., *S 10980*.

S. elliottii (Torr. & A. Gray) G.L. Nesom [*Aster elliottii* Torr. & A. Gray] – $2n = 16$. U.S.A. North Carolina: Onslow Co., NC-50 13.1 km S of NC-53, S of Maple Hill, *S 10538*.

S. ericoides (L.) G.L. Nesom var. *ericoides* [*Aster ericoides* L. var. *ericoides*] – $2n = 10$. CANADA. Manitoba: S of Winnipeg, MB-75 1 km N of Hwy.-305, NW of

Ste. Agathe, *S 10647*. Ontario: Bruce Co., Co. Rd.-22 1.5 km W of Co. Rd.-10, *C & F 13*.

S. georgianum (Alexander *ex* Small) G.L. Nesom [*Aster georgianus* Alexander *ex* Small] – $2n = 50$. U.S.A. Georgia: Jones Co., NE of Gray, US-129 just S of Fortyville Rd., 5.5 km NE of GA-16/22, *S 10875*.

S. laeve (L.) A. Löve & D. Löve × *S. lanceolatum* (Willd.) G.L. Nesom var. *lanceolatum* – $2n = 48$. CANADA. Ontario: Lambton Co., E of Bright's Cove, Co. Rd.-7 at Lambert Rd., *S & Zh 10600*.

S. lanceolatum (Willd.) G.L. Nesom var. *hirsuticaule* (Semple & Chmiel.) G.L. Nesom – $2n = 32$. CANADA. Ontario: Waterloo Reg. Mun., Waterloo, University of Waterloo, along Laurel Creek between Biology 2 and Minota Hagey Residence, *C & S 5*; York Co., N of Ballantrae, *S, Toplack & Stranak 2084b*.

S. lanceolatum (Willd.) G.L. Nesom var. aff. *hirsuticaule* (Semple & Chmiel) G.L. Nesom – $2n = 32$. CANADA. Ontario: Kenora Dist., Hwy.-17 W of Borups Corners, floating bog mat, *S & B. Semple 6732*.

S. lanceolatum (Willd.) G.L. Nesom var. *lanceolatum* – $2n = 48$. U.S.A. Minnesota. Wilkins Co., W of Nashua, jct. MN-9 and MN-55, *S & Ch 5108*.

S. lanceolatum (Willd.) G.L. Nesom var. *latifolium* (Semple & Chmiel.) G.L. Nesom – $2n = 64$. U.S.A. Georgia: Dade Co., SE of Trenton, NW side of Lookout Mt., GA-138 at upper hairpin turn, *S 10998;* Walker Co., W of LaFayette and E of Estella, NW side of Pigeon Mt., GA-193 at hairpin turn, *S 10985*. North Carolina: Watauga Co., E of village of Beech Creek, US-321 0.7 km E of McGuire Rd., *S 10795*. Tennessee: Sullivan Co., Holston Mt., Appalachian Trail near US-421, *S 10773*. West Virginia: Braxton Co., WV-5 ca. 5 km W of Burnville (I-79), embankment of Little Kanawha R., *S 10694*; Marion Co., US-250 2 km SE of Metz, *S 10684*; Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10697*; WV-39 about half way between Canvas and Nettie, *S 10705*.

S. lateriflorum (L.) A. Löve & D. Löve var. *angustifolium* (Wiegand) G.L. Nesom [*Aster lateriflorus* (L.) Britton var. *angustifolius* Wiegand] – $2n = 32$. U.S.A. West Virginia: Marion Co., US-250 3.2 km S of Mannington, MP-19, *S 10691*.

S. lateriflorum (L.) A. Löve & D. Löve var. *lateriflorum* [*Aster lateriflorus* (L.) Britton var. *lateriflorus*] – $2n = 16$. CANADA. Ontario: Peterborough Co., Peterborough, *S 2064*. Québec: Garthby, Lac Aylmer, *S & Keir 4604*. U.S.A. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 0.1 km S of NC-2, *S 10823*. Tennessee: Unicoi Co., S of village of Flag Pond, TN-81N of Sam's Gap (NC border), *S 10819*. Virginia: Bath Co., W of Mountain Grove, VA-39 3.1 km E of WV-92, *S 10724*; Washington Co., S of village of Konnarock, US-58 6.1 km NW by rd. of county line, *S 10762*; E of Damascus, US-58 7.1 km E of VA-91, *S 10766*. – $2n = 32$. U.S.A. Florida: Washington Co., S of Chipley, Falling Waters St. Rec. Area, *S 10947*. Georgia: Greene Co., Oconee Nat'l. For., GA-15 by Harris Creek, 4.5 km S of Oconee R., *S 10869*; Harris Co., E of Pine Mountain, S side of Pine Mt., Kings Gap Rd. 3 km E of GA-354, *S 10977*. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 0.1 km S of NC-2, *S 10824*. Ohio: Portage Co., Notman Rd. near Hwy.-224, *C & C 49*; Richland Co., Mansfield, Henley Rd. ca. 0.7 km W of I-71, *C & C 31*. Pennsylvania: Greene Co., PA-18 4 km SW of Holbrook, junction of Tom's Run Rd., *S 10673*.

S. lowrieanum (Porter) G.L. Nesom [*Aster lowrieanus* Porter] – $2n = 16$. U.S.A. North Carolina: Mitchell Co., NC-261 2.3 km N of Glen Ayre, *S 10816*; Watauga Co., E of village of Beech Creek, US-321 0.7 km E of McGuire Rd., *S 10796*. – $2n = 16 + 2$ supernumeraries. U.S.A. Virginia: Grayson Co., Jefferson Nat'l. For., along Cabin Creek near hairpin turn on US-58, W of For. Rd.-797, *S 10759*.

S. novae-angliae (L.) G.L. Nesom [*Aster novae-angliae* L.] – $2n = 10$. CANADA. Ontario: Lambton Co., N of Camlachie, Lakeshore Rd. 7.2 km NE of Co. Rd.-26, *S & Zh 10598*. U.S.A. Georgia: Dade Co., Tenton, along branch of Lookout Creek, near high school and GA-138, *S 11001*. North Carolina: Henderson Co., NC-280 between towns of Mill River and Avery Creek, just N of Cardinal Rd., possible "wildflower" seeding along roadside, *S 10837*.

S. ontarione (Wiegand) G.L. Nesom var. *ontarione* [*Aster ontarionis* Wiegand] – $2n = 32$. CANADA. Ontario: Essex Co., Maidstone Twp., Co. Rd.-22 W of Puce, Wallace Woods, *C & Parks 22*; Leeds Co., SW of Brockville, 1000 Islands Parkway, 0.4 km SE of Jones Creek, 0.7 km SE of Sherwood Springs Rd., *S 10655*.

S. oolentangiense (Riddell) G.L. Nesom [*Aster oolentangiensis* Riddell] – $2n = 32$. U.S.A. Florida: Gadsden Co., I-10 eastbound rest area, just E of Apalachicola R., *S 10956*. Georgia: Dade Co., SE of Trenton, NW side of Lookout Mt., GA-138 at upper hairpin turn, *S 10997*.

S. patens (Aiton) G.L. Nesom var. *patens* [*Aster patens* Aiton var. *patens*] – $2n = 20$. U.S.A. Georgia: Putnam Co., SW of Warfield, US-129 SE of Little R., 6.3 km N of GA-212, *S 10874*; Taylor Co., SE of Carsonville, old US-19 N of GA-208, 1.4 km S of Little Patsiliga Creek, 3.6 km S of Five Pts., *S 10972*; Walker Co., Chattahoochee Nat'l. For., Maddox Gap, GA-136 at For. Rd.-250, *S 10984*.

S. phlogifolium (Muhl. *ex* Willd.) G.L. Nesom – $2n = 20$. U.S.A. North Carolina: Macon Co., S of Highlands, NC-28 8.3 km S of US-64, 0.8 km N of Wilson Rd., *S 10856*.

S. pilosum (Willd.) G.L. Nesom var. *pilosum* [*Aster pilosus* Willd. var. *pilosus*] – $2n = 32$. U.S.A. Ohio: Richland Co., Mansfield, Hanley Rd. ca. 0.7 km W of I-71, *C & C 32*. North Carolina: Transylvania Co., just NE of Conestee, US-276 8 km S of US-64 (in Brevard), *S 10844*. West Virginia: Marion Co., US-250 2 km SE of Metz, *S 10683*. – $2n = 48$. U.S.A. Virginia: Wythe Co., SW of Speedwell, Iron Mt., Comers Rock, For. Rd.-57 5.5 km W of US-21, *S 10783*.

S. pilosum (Willd.) G.L. Nesom var. *pringlei* (A. Gray) G.L. Nesom [*Aster pilosus* Willd. var. *pringlei* A. Gray.] – $2n = 48$. CANADA. Ontario: Bruce Co., S of South Sauble Beach, Pashwood Dr. just E of Co. Rd.-13, *S 10669*. U.S.A. Virginia: Wythe Co., SW of Speedwell, Iron Mt., Comers Rock, For. Rd.-57 5.5 km W of US-21, *S 10784*. West Virginia: Pocahontas Co., Co. Rd.-21 10.9 km SE of Huntersville (WV-39), *S 10720*.

S. plumosum (Small) Semple [*Aster plumosus* Small] – $2n = 8$. U.S.A. Florida: Franklin Co., S of Sumatra, Apalachicola Nat'l. For., junction of For. Rd.-129 and For. Rd.-129A, 1.95 km E of FL-65, *S 10925*; For. Rd.-129A 3.2 km N of For. Rd.-129, *S 10929*. Note: This species is closely related to *S. concolor*. Both species have a chromosome base number of $x = 4$ and the virguloid type satellite chromosome (Semple et al. 1983).

S. praealtum (Poir.) G.L. Nesom var. *praealtum* [*Aster praealtus* Poir. var. *praealtus*] – $2n = 32$. CANADA. Ontario: Essex Co., Windsor, field S of Spring Garden Blvd., SE of school, *S & Zh 10604*.

S. prenanthoides (Muhl.) G.L. Nesom [*Aster prenanthoides* Muhl.] – $2n = 32$. CANADA. Ontario: Elgin Co., Hwy.-73 2.5 km W of Copenhagen, along creek S of rd., *S & Zh 10595*; Little Jerry Creek, N of Hwy.-3, *S & Zh 10591*; Little Jerry Creek, S of Hwy.-3, *S & Zh 10592*; S of Orwell, N edge of Springwater Conservation Area, *S & Zh 10588*; W of Vienna along Big Otter Creek, *S & Zh 10593*; S of Wallacetown, S of TyrConnell, small creek near Lake Erie, *S & Zh 10581*, *S & Zh 10582*. U.S.A. Ohio: Carrol Co., junction of Hwy.-43 and Belleflower Rd., *C & C 48*. Pennsylvania: Clarion Co., Hwy.-36 0.5 km S of Newmansville, *C & C 61*; Greene Co., PA-18 0.8 km S of Nettle Hill, *S 10679*; Lawrence Co., McConnelly Mill St. Pk., *C & C 53*. Virginia: Bath Co., W of Mountain Grove, VA-39 3.0 km E of WV-92, *S 10726*; Grayson Co., Jefferson Nat'l. For., along Cabin Creek near hairpin turn on US-58, W of For. Rd.-797, *S 10758*. West Virginia: Greenbriar Co., WV-39/55 just E of Nicholas Co. line, *S 10708*; Marion Co., US-250 2 km SE of Metz, *S 10680*; S of Ida May, WV-216 3.8 km S of US-250, *S 10692*; Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10698*.

S. priceae (Britton) G.L. Nesom [*Aster priceae* Britton] – $2n = 64$. U.S.A. Georgia: Walker Co., Davis Crossroads, cedar glade at junction of GA-193 and GA-341, *S 10988*.

S. puniceum (L.) G.L. Nesom [*Aster puniceus* L.] – $2n = 16$. U.S.A. Georgia: Banks Co., N of Commerce, US-441 1.1 km S of I-85, *S 10864*. New York: Chautaqua Co., Hwy.-474, *C & C 69*. North Carolina: Marion Co., Highlands, NC-28 0.6 km S of US-64, opposite U.S. Post Office, *S 10853*; Mitchell Co., Roan Mt., Garden Trail, S of parking lot near information booth, *S 10812*. Tennessee: Unicoi Co., S of village of Flag Pond, TN-81 N of Sam's Gap (NC border), *S 10818*. West Virginia: Nicholas Co., Summerville, WV-39 just E of US-19, *S 10707*.

S. puniceum (L.) G.L. Nesom × *S. urophyllum* (Lindl. *in* DC.) G.L. Nesom – $2n = 16$. U.S.A. North Carolina: Mitchell Co., Roan Mt., Garden Trail, S of parking lot near information booth, *S 10811*.

S. racemosum (Elliott) G.L. Nesom [*Aster racemosus* Elliott, *A. vimineus* authors not Lam.] – $2n = 16$. U.S.A. Delaware: Sussex Co., E of Georgetown, *S & Ringius 7644*. – $2n = 32$. U.S.A. Georgia: Gordon Co., I-75 N of Calhoun, south bound side rest area, *S & B. Semple 7402*.

S. retroflexum (Lindl. *in* DC.) G.L. Nesom [*Aster retroflexus* Lindl. *in* DC.] – $2n = 48$. U.S.A. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 0.1 km S of NC-2, *S 10829*; Marion Co., Highlands, NC-28 0.6 km S of US-64, opposite U.S. Post Office, *S 10854*. South Carolina: Greenville Co., US-276 5.2 km S (by rd.) of entrance to Caesar's Head St. Pk., *S 10839*. Tennessee: Sullivan Co., US-421 5.8 km W of county line, *S 10769*.

S. shortii (Lindl. *in* Hook.) G.L. Nesom [*Aster shortii* Lindl. *in* Hook.] – $2n = 16$. CANADA. Ontario: Point Pelee, Co. Rd.-33 SE of Leamington, rd. side opposite lot # 914, *S & Zh 10580*. – $2n = 16 + 2$ supernumeraries. CANADA. Ontario: Essex Co., E of Colchester, Co. Rd.-50, lot #257, W of Holiday Bluff Rd., *S & Zh 10579*.

S. simmondsii (Small) G.L. Nesom [*Aster simmondsii* Small] – $2n = 64$. U.S.A. Florida: Hamilton Co., SE of Jasper, US-41 2.2 km SE of West Occidental Train Station, *S 10965*.

S. tradescanti (L.) G.L. Nesom [*Aster tradescanti* L.] – $2n = 32$. U.S.A. Maine:

Penobscot Co., Old Town, rock outcrop by Stillwater R., just down stream from Gilman Falls, *Haines s.n.*

S. undulatum (L.) G.L. Nesom [*Aster undulatus* L.] – $2n = 32$. U.S.A. Georgia: Harris Co., Hines Gap Rd. 08. km, S of GA-90, F.D.R. St. Pk. near top of Pine Mt., *S 10975*. North Carolina: Henderson Co., W of Avery Creek, Pisgah Nat'l. For., For. Rd.-479 1.6 km SW of NC-2, *S 10830*. Ohio: Ashland Co., Mohican St. Pk. near Hwy.-97, *C & C 35*. Virginia: Bland Co., S of Bastian, Appalachian Trail just E of I-77, *S 10739*. West Virginia: Nicholas Co., S of Birch River, Youngs Monument Rd. 0.6 km NW of US-19, along Brown's Ridge, *S 10700*.

S. urophyllum (Lindl. *in* DC.) G.L. Nesom [*Aster urophyllus* Lindl. *in* DC.] – $2n = 16$. CANADA. Ontario: Elgin Co., Hwy.-73 2.5 km W of Copenhagen, *S & Zh 10594*. U.S.A. North Carolina: Mitchell Co., Roan Mt., Garden Trail, S of parking lot near information booth, *S 10810*.